



KEMENTERIAN  
KESEHATAN  
REPUBLIK  
INDONESIA



**GERMAS**  
Gerakan Masyarakat  
Hidup Sehat



# COVID-19 Imaging with Thoracic CT

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# COVID-19 RESPONSE IN INDONESIA

**Latest News :** The number of the people under observation is 41,605 people, while the number of the suspects is 13,335 people. There were 465,683 people had been examined by PCR tests with 410,591 people were proven negative. In addition, there are 55,092 people confirmed cases of COVID-19, 23,800 recovered, and 2,805 deaths in 34 provinces and 448 districts/cities in Indonesia. Real-Time PCR Testing has been performed in Indonesia. Please wear your mask to protect yourself and others. Cotton masks should be worn maximum for 4 hours. Wash your hands with soap. Avoid close contact with crowds of any size and maintain physical distance.

## ISSUED EMERGENCY STATUS

**RESPONSE TASK FORCE**  
**34** Provinces  
**496** Districts/Cities

**LARGESCALE MOVEMENT RESTRICTION**  
**1** Provinces  
**8** Districts/Cities

Source : Indonesian Task Force for COVID-19, June 29th 2020

## PCR TEST

**9,047**  
**465,683** People  
**1,725** People / 1 M Population

**11,783**  
**782,383** Specimens

Source : Ministry of Health

## LOGISTICS & VOLUNTEERS

**TOTAL MEDICAL SUPPLIES DISTRIBUTION**  
**33,595,215**  
DISTRIBUTED IN 34 PROVINCES

**TOTAL MEDICAL & NON MEDICAL VOLUNTEERS**  
**30,878**  
DISTRIBUTED IN 26 PROVINCES

Source : Indonesian Task Force for COVID-19

## TOTAL NUMBER OF COVID-19 CASES IN INDONESIA

As per June 29th 2020 at 12.00 P.M.

**1,082**  
**55,092** CONFIRMED CASES

**864**  
**23,800** RECOVERED

**51**  
**2,805** DEATHS

## SPREAD IN 34 PROVINCES, 448 CITIES

Source : The Ministry of Health of the Republic of Indonesia

## NUMBER OF CONFIRMED COVID-19 SPREAD IN 216 COUNTRY AND AREA/TERRITORIAL

As per June 29th 2020 at 12.00 P.M.

No.	Country	Number of Cases	Deaths	Population	Deaths / 1 M Pop
	World	9,843,073	495,760	7,794,798,739	64
1	USA	2,452,048	124,811	331,002,651	377
2	Brazil	1,274,974	55,961	212,559,417	263
3	Russia	634,437	9,073	145,934,462	62
4	India	528,859	16,095	1,380,004,385	12
5	UK	310,254	43,514	67,886,011	641
6	Peru	272,364	8,939	32,971,854	271
7	Chile	267,766	5,347	19,116,201	280
8	Spain	248,469	28,341	46,754,778	606
9	Italy	240,136	34,716	60,461,826	574
10	Iran	220,180	10,364	83,992,949	123
28	Indonesia	55,092	2,805	269,603,400	10

Source : World Health Organization (WHO), worldometers.info (UN Population Division), BPS

## INCOMING FUNDS

**NATIONAL ACCOUNT** | **INTERNATIONAL ACCOUNT** | **DONATION**

IDR 54.99 B | IDR 104.87 B | IDR 75.2 B

Source : Indonesian Task Force for COVID-19 June 29th 2020

**TOTAL IDR 235 B**

## INFORMATION

**OFFICIAL SITE**

[www.covid19.go.id](http://www.covid19.go.id)

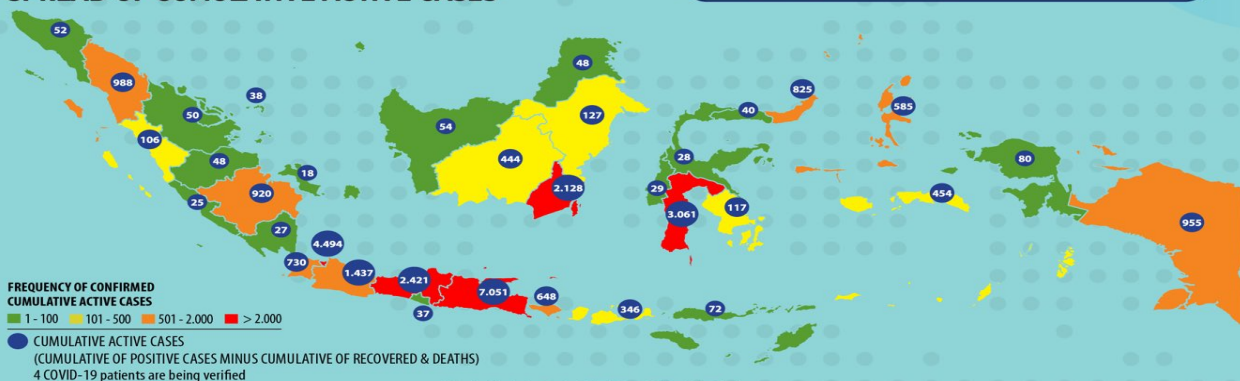
**CALL CENTER 119**



Preparedness Protocol of COVID-19

No : 146/U79/099/COVID-19/BNPB/29062020

## SPREAD OF CUMULATIVE ACTIVE CASES



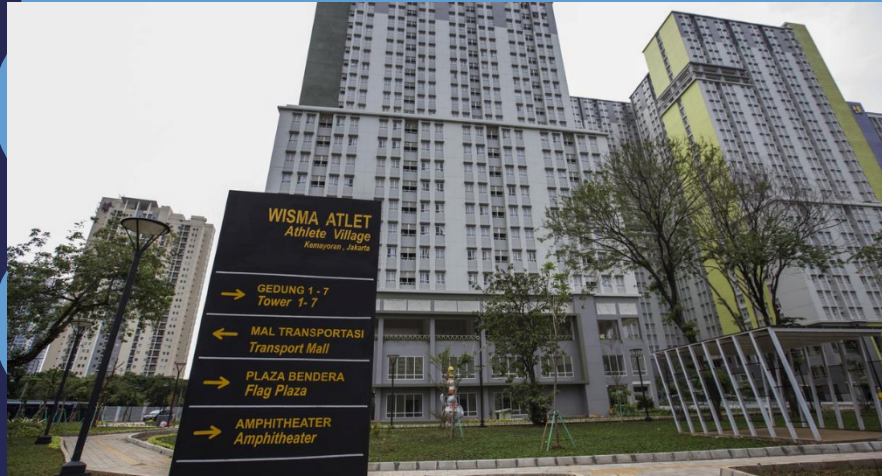
## DAILY CASES GRAPH





# Indonesian Government Policy on handling COVID-19

- Switch function of Athletes Village Kemayoran into Covid's Emergency Hospital



- Large Scale Social Restriction (PSBB)

- Provide information dissemination of COVID-19 in Indonesia



- Socialization of Covid-19 symptoms and prevention



- Socialization Clean and Healthy Behavior
- Use a mask in every activities
- Online school and college activities

A person wearing a white lab coat is shown from the chest down, holding a small vial with a green cap and a pipette. They are transferring a liquid from the vial into a test tube held in their other hand. The background is a solid blue color.

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- Environment & Equipment Disinfection
- References



# Introduction

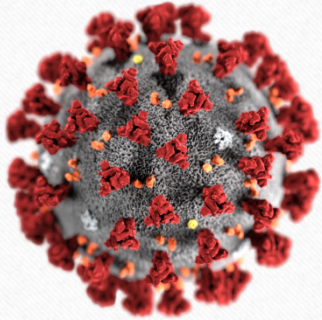


# Introduction

A cluster of pneumonia cases in Wuhan, China was first reported to the WHO Country Office in China on 31 December 2019 and was characterized as a pandemic on 11 March 2020



World Health  
Organization

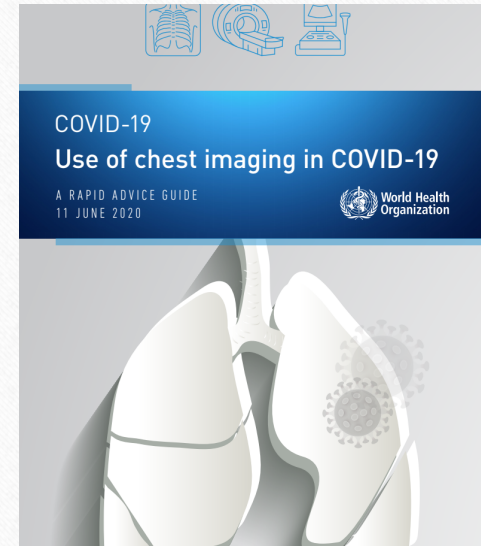


This virus was named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and the associated disease was named coronavirus disease 2019 (COVID-19)

COVID-19 symptoms aren't specific and can be easily confused for other infections, such as flu, H1N1, SARS, and MERS, and the concurrent flu season can make accurate identification even more difficult.

# Intro....

The World Health Organization(WHO) in association with Centre for Disease Control & Prevention (CDC) have published guidelines on the COVID-19 outbreak pandemic.



According to the CDC, even if a chest CT or X-ray suggests COVID-19, viral testing is the only specific method for diagnosis.



# Recommendations



**R1**

For asymptomatic contacts of patients with COVID-19, WHO suggests not using chest imaging for the diagnosis of COVID-19.

*Conditional recommendation, based on expert opinion*

**Remark**

RT-PCR should be done to confirm diagnosis.

**R2**

**R2.1** For symptomatic patients with suspected COVID-19, WHO suggests not using chest imaging for the diagnostic workup of COVID-19 when RT-PCR testing is available with timely results.

*Conditional recommendation, based on low certainty evidence*

**Remark**

RT-PCR should be done to confirm diagnosis.

**R2.2** For symptomatic patients with suspected COVID-19, WHO suggests using chest imaging for the diagnostic workup of COVID-19 when:

- (1) RT-PCR testing is not available;
- (2) RT-PCR testing is available, but results are delayed; and
- (3) initial RT-PCR testing is negative, but with high clinical of suspicion of COVID-19.

*Conditional recommendation, based on low certainty evidence*

**Remarks**

Imaging should be used as one element of the diagnostic workup that otherwise includes clinical and laboratory data. Patients likely to benefit are those who:

- have severe symptoms and/or signs on physical exam;
- require emergency procedures or other urgent interventions (e.g. for stroke or requiring haemodialysis);
- have presentations that could represent complications of COVID-19 (e.g. pneumonia, pulmonary arterial thrombosis or thromboembolism);
- need to be admitted irrespective of diagnosis (e.g. disease is severe or likely to progress), to help with disposition or triaging (e.g. to dedicated COVID-19 ward vs non-COVID-19 ward);
- need to be transferred to another facility;
- live with people at high risk if infected with COVID-19 (e.g. immunocompromised, persons aged over 60 years);
- live in small homes, overcrowded households or densely-populated settings, where isolation is very difficult to implement; live in communities with people at high risk such as retirement homes or dormitories.

**R3**

For patients with suspected or confirmed COVID-19, not currently hospitalized and with mild symptoms, WHO suggests using chest imaging in addition to clinical and laboratory assessment to decide on hospital admission versus home discharge.

*Conditional recommendation, based on expert opinion*

**Remarks**

Imaging should be used as one element of the patient evaluation that otherwise includes clinical, laboratory and epidemiological data. Patients likely to benefit are those who:

- are at high risk of disease progression;
- have associated comorbidities (e.g. diabetes, hypertension, heart disease, obesity) or other chronic diseases which might decompensate and/or are aged over 60 years;
- live with individuals at high risk of morbidity and mortality associated with COVID-19 (e.g. persons aged over 60 years, immunocompromised), whether at home or retirement home;
- live in small homes, overcrowded households or densely-populated settings where isolation is very difficult to implement.
- represent an increased risk of dissemination within their community due to their occupational, social or other circumstances.

**R4**

For patients with suspected or confirmed COVID-19, not currently hospitalized and with moderate to severe symptoms, WHO suggests using chest imaging in addition to clinical and laboratory assessment to decide on regular ward admission versus intensive care unit (ICU) admission.

*Conditional recommendation, based on very low certainty evidence*

**Remarks**

Imaging should be used as one element of the patient evaluation that otherwise includes clinical and laboratory data. Patients likely to benefit are those who:

- are at higher risk of disease progression (e.g. with comorbidities);
- are not responding to supportive treatment (e.g. oxygen supplementation);
- present acute clinical deterioration not elucidated.

**R5**

For patients with suspected or confirmed COVID-19, currently hospitalized and with moderate to severe symptoms, WHO suggests using chest imaging in addition to clinical and laboratory assessment to inform the therapeutic management.

*Conditional recommendation, based on very low certainty evidence*

**Remarks**

Imaging should be used as one element of patient evaluation that otherwise includes clinical and laboratory data. Patients likely to benefit are those who:

- are at high risk of disease progression;
- are not responding to treatment (oxygen supplementation);
- have presentations with clinical suspicion of pulmonary fibrosis, pulmonary artery thrombosis or thromboembolism.

**R6**

For hospitalized patients with COVID-19 whose symptoms are resolved, WHO suggests not using chest imaging in addition to clinical and/or laboratory assessment to inform the decision regarding discharge.

*Conditional recommendation, based on expert opinion*

**Remarks**

When imaging is used, it should be one element of the patient evaluation that otherwise includes clinical and laboratory data. Patients likely to benefit from chest imaging are those who:

- have had a severe form of COVID-19;
- have pre-existing chronic lung disease.



## Standart Operation Protocol





# Standart Operation Protocol



Radiology policy goals are to reduce COVID-19 related morbidity and mortality through early diagnosis, appropriate treatment and prevention of disease dissemination.



Radiology departments must prepare for patient surges through streamlined approaches to imaging that will limit exposures to healthcare workers and patients.



CT should be used sparingly and reserved for hospitalized, symptomatic patients with specific clinical indications for CT.



The surfaces of these machines can be easily cleaned, avoiding the need to bring patients into radiography rooms.



Radiologists should familiarize themselves with the CT appearance of COVID-19 infection in order to be able to identify findings consistent with infection in patients imaged for other reasons.



# Thorax CT Scan Protocol for COVID-19



The radiographers/radiological technologists performing chest CT should follow droplet and contact precautions (airborne precautions required only for aerosol-generating procedures)



Separate clean console control area from contaminated CT scanner room; the radiographer technologist must remove gloves and wash hands before entering the console area



Consider all equipment in the imaging room as contaminated: CT gantry controls and contrast media injector control screen keys; they must be used with gloves.



Consider all equipment in the control area as clean: CT console keyboard, mouse and exposure pad as well as the contrast media injector remote control panel; they may be used without glove

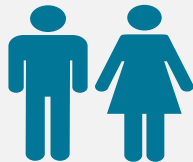


Avoid crowding and maintain the safety distance of at least 1 metre





All routine imaging services should be rescheduled during pandemic period.

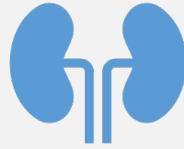


Movement of patients, relatives and staff should be restricted.



All employees should maintain proper hand hygiene and use mask.





Every patient should be counselled properly before the test.



Proper room cleaning should be done.



Machine and imaging room should be disinfected twice daily.

## **Staff preparation:**

1. It is recommended to arrange two technicians: One technician to operate the CT equipment and another technician to enter the machine room full-time to position and train the patient's breathing and breath-holding essentials.
2. It is important to replace any disposables and also perform the required disinfections procedures before taking part in the next CT scan.

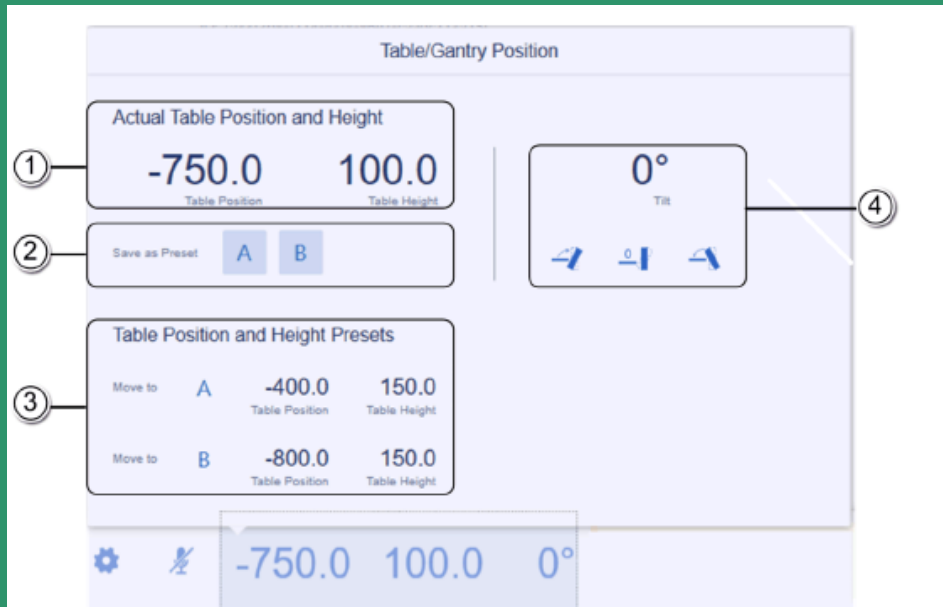
## **Patient preparation:**

1. Patients (including assistance personal) should be wearing medical surgical mask or N95 medical respirator throughout the examination.
2. Before entering the machine room, use hand sanitizer to disinfect hands. Remove neck, chest accessories and other high-density items (such as bra and zippers, buttons, etc.).
3. If possible, train the breathing instruction and ask the patient to cooperate during exam.
4. Perform the scan using a Thorax protocol with the recommended parameter
5. After the patient left the room, clean and disinfect the CT Scanner and the

## Other isolation matters:

1. For cooperative and mobile patients use intercom to explain the matters needing attention for examination.
2. For these patients, the technician can, on the promise of ensuring the safety of the patient, guide the patient to position in the operation room by voice control, or ask the accompanying personnel to assist the patient on the examination table.
3. The technician should keep a distance of 1-2m or more from the patient if possible.





# How to position the patient and maintain distance?

**For SOMARIS 10 syngo CT user:**

Make use of the **Mobile Workflow** with the **tablet** and **remote scan control**!

1. Customer could use A/B button on the tablet to preset one table position and reduce the time standing right next to the patient.
2. Using the Remote Scan Control the user has the possibility to switch on the Gantry Laser Lights for proper iso-centric positioning of the patient.

**For SOMARIS 5 & SOMARIS 7 *syngo* CT user:**

1. For SOMARIS 5 and SOMARIS 7, the A/B buttons are not suitable for positioning the patient from outside of the scan room because these buttons are located on the gantry.
2. One method is, user could record the number of preferred table position, and input these numbers to move table to the desired position without entering the scan room and then move the patient to the iso-center.

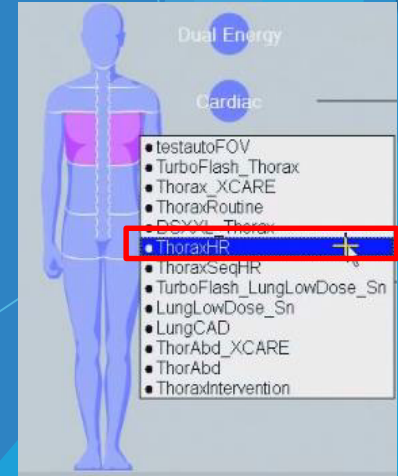
Table:Position	Height
644.6 ▾	125.0

# Scan parameters

## CT scan protocol

1. Scanning body position: Head first for better control of positioning the patient and the arms above the head.
2. Scanning mode: spiral scanning.
3. Scanning range: include always the complete Lung by using **FAST Planning** (if available).  
In any case, verify the range include from the tip of the lung to the bottom of the diaphragm (including bilateral costal and diaphragmatic angles)

Using the **default Thorax HR protocol** without further modifications of the scan and recon parameter.



## CT scan protocol

With **SOMARIS 10** scanners please use the **default Thorax protocol** with some changes to optimize image quality:

- Set parameter **CARE kV optimized for** to **Non-Contrast**, because scans are done without contrast media
- On **go Top** set the **rotation time to 0.5 s** to acquire more readings. To compensate the scan time increase, set the **pitch to 0.8**
- Add a **lung thin slice recon job** e.g. Multi Orientation with 1.5 mm slice thickness and maybe **more dose** to compensate for the increased noise, e.g. **~40% more Q. ref. mAs**
- If necessary, for **obese patients on go.Now** you can set up an additional obese scan protocol with a **lower pitch of 0.8**, but this is done automatically with Adjust button



Patient Type

all

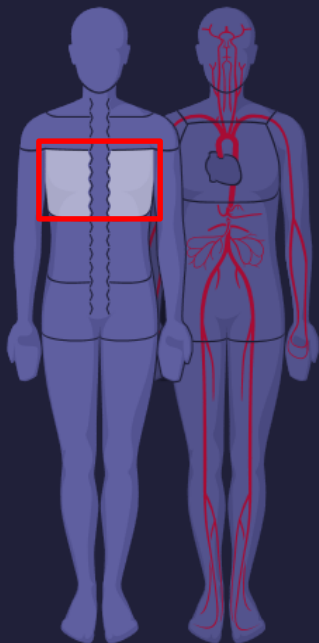
Contrast Protocol

all

syngo.via

all

Child



### Protocol: Thorax



-Indications: masses, tumor, metastases, lymphoma, lymph nodes, tuberculosis, empyema, infection, w/wo CM  
-Scan modes: RoutineSpiralAdultThoraxXcare

✓Topogram

Thorax



### Protocol: Thorax and Abdomen



-Indications: masses, tumor, lymphoma, lymph nodes of the lung, liver, pancreas, gall bladder, spleen, kidneys, w CM  
-Scan modes: RoutineSpiralAdultThoraxXcare, RoutineSpiralAdultAbdomen

✓Topogram

Thorax

Abdomen



### Protocol: Lung Low Dose



-Indications: early visualization of pulmonary nodules, screening of the lung, wo CM  
-Scan modes: RoutineSpiralAdultThoraxSnXcare

✓Topogram

Lung





Scan Favorites

General Scan

Dose

Timing

Config

Phys

Scan/Recon

CARE Dose4D &amp; CARE kV

CARE kV optimized for

Rot. Time  
[s]

Pitch

CARE kV Quality ref. mAs @120 kV

Thorax

Full

Non-Contrast

0.50

0.80

70



Recon FAVORITES

General Recon

Image Impression

Recon Box

Physio Recon

Scan/Recon

Slice Thickness  
[mm]Increment  
[mm]

Window

Kernel

FAST Planning

FAST Planning  
Width

FAST

Thorax 1.50 Br60 S3 cor

Thorax 1.50 Br60 S3 sag

Thorax 1.50 Br60 S3 ax

1.50

1.50

Lung

Br60

Thorax - Lung

Narrow

For **follow up or dose sensitive patients** a low dose protocol could be a good alternative.

**Lung Low Dose** factory protocols are available on all scanners.

Depending on the specific scanner and license settings, lung low dose protocols of different technical flavors might be available, e.g. in high pitch mode (TurboFlash), in high resolution (HR), with tin filter (Sn) or with iterative reconstruction (IR).

# Reconstructions

## Reconstruction Parameter:

1. **Conventional image reconstruction:** lung window images (window width 1000 ~ 1500 HU, window level -650 ~ -500 HU) and mediastinal window images (window width 250 ~ 300HU, window level 30 ~ 50HU) were reconstructed with 3mm layer thickness respectively. HR kernel not needed.
2. **Thin slice image reconstruction:** the thin-layer lung window image (HR kernel, window width 1000 ~ 1500HU, window level -650 ~ -500HU) is routinely constructed with a thickness of 1,5 mm or less. For SOMARIS 10scanners, simply add a lung thin slice recon job e.g. Multi Orientation with 1.5 mm slice thickness



## **Environment & Equipment Disinfection**

“♦” indicates tested and approved cleaning agents or disinfectants.

System component / accessory	Cleaning agents and disinfectants (MFR 890/009 - 2017)												
	Antistatic cleaner pH-neutral cleaning agent	Surgical spirit	Alcohols	Aldehyde	Quaternary compounds	Guandin derivatives	Pyridin derivatives	Chlorine derivatives	Benzene	Alkylamines	Phenol derivatives	Organic acids	Peroxide compounds
<b>Gantry</b>													
Gantry cover	♦	♦	♦ <sup>1)</sup>	♦	♦	♦	♦	♦	♦	♦		♦	♦
Gantry operator panel	♦	♦	♦ <sup>1)</sup>	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Touch Panel	♦	♦	♦ <sup>1)</sup>	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
<b>Patient table</b>													
Patient table	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Surgical rail	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦		♦
Mattress	♦					♦		♦		♦			
<b>Monitor</b>													
Monitor housing	♦		♦ <sup>1)</sup>	♦	♦	♦		♦	♦	♦		♦	♦
Monitor screen	♦												
<b>Other system components</b>													
Foam material (for example, positioning aids)	♦					♦		♦		♦			
Monitor ceiling system	♦	♦	♦	♦	♦	♦		♦		♦		♦	♦
Image Reconstruction System (IRS)	♦			♦	♦	♦	♦	♦	♦	♦		♦	♦
Body straps	♦			♦		♦		♦		♦		♦	♦
ECG cables			♦ <sup>1)</sup>										
Foot switch	♦			♦	♦	♦		♦		♦		♦	♦
3D camera assembly	♦		♦ <sup>1)</sup>	♦	♦	♦	♦	♦		♦		♦	♦

<sup>1)</sup> ≤ 70 Vol% alcohol

The United States Environmental Protection Agency provides a list of products that meet EPA's criteria for use against SARS-CoV-2, the novel coronavirus that causes the disease COVID-19:

<https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>

Please always refer to the official Operator Manual and Instruction for Use (IFU)!

See the document “Instructions for Use – Cleaning and disinfection syngo CT VB20”





Air Disinfection: All the central air conditioners should be turned off to prevent air contamination with each other.



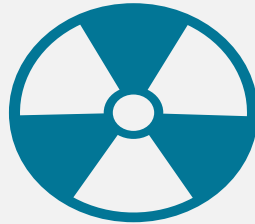
The door should be open in infected areas for ventilation each time more than 30 min, once in every 4 hours.



The air should be continuously sterilized four times a day.



Equipment disinfection: The equipment in the contaminated area should be wiped with 2,000 mg/L chlorine-containing disinfectant.



The DR and CT gantry in the contaminated area should be wiped with 75% ethanol.



Ground disinfection: The floor should be wiped with 1,000 mg/L chlorine-containing disinfectant once in every 4 hours.



Use of large stationary HEPA filters in temporarily closed imaging suites can allow for sedimentation and removal of small aerosol particles.

## Monitor

### WARNING

Cleaning of parts of the system while the system is connected to the power supply!

**Electric shock due to possible contact with line voltage.**

- ◆ Always switch the system off at the main power switch before cleaning or disinfecting.

## Cleaning and disinfecting the equipment

The following safety information has to be followed in general.

### CAUTION

Insufficient cleaning or disinfection of the equipment!

**Injury to the patient or the personnel (bio hazard).**

- ◆ Always clean or disinfect the equipment after use. Observe the instructions for cleaning and disinfecting.

Check if system components or accessories are worn out to ensure proper cleaning. Replace worn out components or accessories immediately.

Make sure that the table and the accessories are clean and covered with paper, if possible.

### CAUTION

Using improper cleaning solvents!

**Injury to the cleaning personnel (allergic reaction or allergic shock) and damage to the equipment.**

- ◆ Follow the cleaning and disinfecting instructions of the Instructions for Use.

Do not use unsuitable cleaning agents. Always use cleaning media also approved for humans.

Follow the instructions of the disinfectant manufacturer and observe the dosage instructions.

## Cleaning and disinfecting the tablet

### CAUTION

Using improper cleaning solvents!

**Injury to the cleaning personnel (allergic reaction or allergic shock) and damage to the equipment.**

- ◆ Follow the cleaning and disinfecting instructions of the Instructions for Use.

Do not use unsuitable cleaning agents. Always use cleaning media also approved for humans.

Follow the instructions of the disinfectant manufacturer and observe the dosage instructions.

**Please always refer  
to the official Operator  
Manual and Instruction  
for Use (IFU)!**

## Monitor ceiling system

### WARNING

Liquids in the monitor ceiling system, power supply cables are laid inside!

**Electric shock**

- ◆ Make sure that no liquids, for example cleaning fluids, can get into the interior of the monitor ceiling system.

### CAUTION

Dirt and liquid in the monitor arm of the ceiling mounted monitor!

**Infection possible**

- ◆ Clean the monitor and monitor arm after use.



### A3.2 Chest computed tomography (CT)

- The radiographers/radiological technologists performing chest CT should follow droplet and contact precautions (airborne precautions required only for aerosol-generating procedures) (A1, A4).
- Consider implementing a containment zipper (a room isolation tarp barrier with a zipper for room access) to separate the control area from the imaging room. Practice infection control in accordance with national public health guidelines, relevant department policies and instructions from the committees responsible for hospital infectious disease control and hospital waste management.
- Separate clean console control area from contaminated CT scanner room; the radiographer/radiological technologist must remove gloves and wash hands before entering the console control area.
- Consider all equipment in the imaging room as contaminated: CT gantry controls and contrast media injector control screen keys; they must be used with gloves.
- Consider all equipment in the control area as clean: CT console keyboard, mouse and exposure pad as well as the contrast media injector remote control panel; they may be used without gloves.
- Avoid crowding and maintain the safety distance of at least 1 metre.



- Remove any radiopaque objects in the region of interest from the patient very carefully to prevent risk of infection transmission.
- Perform examination (i.e. scanning and intravenous contrast media injection) in consideration of the diagnostic requirements and the principles of justification, optimization, radiation dose limitation as well as the radiographer/radiological technologist ethical code and professional rights at all times (A8, A9).
- Note which personnel are involved in and present during the procedure.
- Ensure that single use CT couch paper cover is removed and disposed of into the corresponding bin according to hospital policy.
- The control panel integrated into the contrast media injector delivery device, which is located in the imaging room, may be covered with a disposable plastic cover.
- When performing CT on patients confirmed with COVID-19, radiographers/radiological technologists must follow the instructions and guidance of the hospital committee responsible for infectious disease control.
  - Asymptomatic patients pose a latent threat for medical imaging and therapy departments and hence radiographers/radiological technologists in CT are advised to follow the instructions divided in three stages (i.e. preparation, during and post procedure; see Table A1).



## References

# References

- Kotian, R P; Das, PJ; and Pan, S. 2020. Standard Operation Protocols & Guidelines for Radiology Departments. Indian Society of Radiographers and Technologists
- Chung, M; dkk. 2020. CT Imaging Features of 2019 Novel Coronavirus (2019-nCoV)
- World Health Organization. 2020. Use of chest imaging in COVID-19



Thank you